

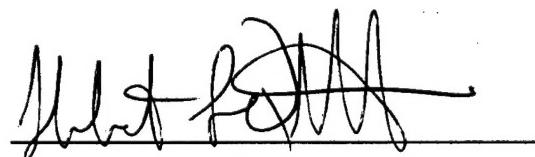
NAVAL WAR COLLEGE

**PRODUCT FUEL TANKERS:
WEAKNESS IN STRATEGIC READINESS
BY
LCDR HUMBERTO L. QUINTANILLA II, USN**

A paper submitted to the Faculty of the Naval War College in partial satisfaction of the requirements of the Department of National Security Decision Making.

The contents of this paper reflect my own personal views and are not necessarily endorsed by the Naval War College or the Department of the Navy.

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Abstract of

PRODUCT FUEL TANKERS: WEAKNESS IN READINESS

This study examines the problems associated with maintaining a viable number of distilled bulk petroleum product fuel tankers available to the United States government and military to haul fuel to the strategic battlefields in the future. With the employment of mechanized ground forces, rotary and fixed wing aircraft, and vehicles that are dependent on petroleum fuel, the strategic campaign to defeat an enemy may be jeopardized by the lack of available fuel tankers to transport bulk fuel stocks into theater at the time when resupply stocks are needed. Of particular importance is the lack of commercial product fuel tankers that can be brought under United States government contract without seriously jeopardizing the global economy that these specialized ships normally serve. A clever and determined enemy can destroy or deny the use of the finite number of bulk petroleum product fuel tankers supporting commercial industry with the end result being a defeat or stalemate delivered to United States forces through lack of strategic fuel supplies. The limited number of "for hire" product fuel tankers in service are incapable of satisfying the fuel haul requirements of the Department of defense in times of crisis or emergency.

THE QUANDARY OF FUEL

*"Excuses for failure attributed to shortness of coal will be closely scrutinized; and justly."*¹
Alfred T. Mahan, Naval Strategy, 1911

All modern military organizations rely on fossil fuels, specifically distilled petroleum fuels, to power their war machines. Technological advances have improved the fuel efficiency of these machines, such as ground vehicles and aircraft, and have improved the accuracy of their onboard sensors and weapons systems. What technology has not given to the military hardware consumer is deliverance from having to accumulate and distribute bulk quantities of distilled petroleum fuel for its other than nuclear, solar, wind, or battery powered equipment. When analyzing the United States military force structure, it is clear that we have a tremendous dependence on distilled bulk petroleum fuels, of numerous grades and specifications, to carryout our military missions. There is also the tremendous burden of storing and providing security for this fuel so that it is available when needed by U.S. and Allied Forces. Therefore, there is a large investment in fuel storage, distribution, and handling facilities in overseas theaters where United states Forces are forward deployed.

For our forces stationed overseas, these fuel requirements are satisfied through ocean-going product fuel tankers delivering bulk fuel to facilities designated by the Department of Defense Joint Petroleum Office (JPO) as entry points into their distribution system. These product fuel tankers are commercial ships, of varying capabilities and specifications, that are under contract to deliver fuel. Their business is to haul fuel for hire and serve the private and public sectors of the global economy with bulk petroleum transportation services. Those product fuel tankers that are not for contract hire are owned and operated by their parent or controlling oil companies to haul company products. The limited number of "for hire" product fuel tankers in service are incapable of satisfying the fuel haul requirements of the Department of defense in times of crisis or emergency.

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HISTORY HAS BLINDED AMERICA

The value of history in the art of war is not only to elucidate the resemblance of the past and present, but also their essential differences.”²
Sir Julian Corbett, 1854-1922

The United States has made efficient use of its military-industrial complex in support of its foreign policy objectives. In every crisis and war of this century, the United States has been able to draw on its industrial, economic, financial, and military power to provide all of the necessary equipment and war materials for the military to prevail over the enemies of America. The costs of these war efforts were only cogently debated by Congress, the media, and the general public once the military mission was already underway and there was hardly any doubt that America could not, or would not, finance the policy objectives that were now to be decided by armed force. The belief that America would prevail in all wars up to the present day, and will prevail in all future military endeavors, is deeply ingrained in the American psyche. The costs of war are not so much monetary as they are the avoidance of personnel casualties. Our American way of war is annihilation³, and we invest in technologically advanced weapons that are capable of overwhelming our enemies so that we may avoid the loss of American lives. This is a very simple strategy for winning wars, and also one that is also politically safe.

However, the lessons from the victories in our past cannot be trusted to deliver the United States from peril. Of particular concern is our ability to keep bulk fuels moving across open seas to the strategic battlefield. Our historical experience has been that no enemy could deny us the use of the sea for more than a portion of any war we have fought. In World War II, at the height of the Battle of the North Atlantic, the Nazi U-boats were sinking a large proportion of convoy tonnage. Yet, the losses were made up by the output of American industry. The same output was skillfully applied to the war efforts in the Pacific theater. Our enemy's could not overcome our ability to out-build and out-pay the American industrial and financial capacity. In the Korean and Vietnam Wars, America paid for armistice after inconclusive warfighting. The peculiar aspect

of these wars is that they did not present the United States with a threat to the sea lines of communications with the exception of the littoral sea and river mining operations conducted by the enemy. In operation Desert Shield/Desert Storm, unopposed logistics efforts, overwhelming American military combat superiority, and Iraqi incompetence, paved the way for Allied victory. What fuel could not be obtained in theater was hauled to the Arabian Gulf by product fuel tankers. The only tragedy that befell any United States Navy oiler or tanker in Desert Shield/Desert Storm were the circumstances surrounding the USNS Andrew J. Higgins (T-AO 193) striking an uncharted and submerged pinnacle rock while operating in support of naval operations. The loss of this specialized Underway Replenishment Oiler caused near panic for the theater naval forces mindful of at-sea refueling requirements. This particular incident highlights the precarious position that offensive forces can be placed in when they are separated from their fuel sources. The Higgins represented a specialized and scarce logistics asset serving the at-sea forces and fulfilled a vital role. The Higgins was replaced as quickly as possible and the preparations for war continued. There was hardly any real doubt that we would prevail in our stated objective to re-establish the deposed Kuwaiti Government.

THE RESERVE SHIPS THAT WE COUNT ON

*"The great secret of battle is to have a reserve. I always had."*⁴
Wellington, 1769-1852

The United States maintains a National Defense Reserve Fleet consisting of ships that are located in various ports throughout the continental United States. The three primary locations where these reserve ships are maintained is in Susuin Bay (San Francisco Bay-Sacramento River), California; Beaumont, Texas; and James River, Virginia. The purpose of this fleet is to maintain inactive, government owned shipping, in the event that additional merchant ships are needed to assist in meeting United States' shipping requirements in times of national emergency. This fleet is managed and maintained by the Maritime Administration. In time of war, the Maritime

Administration activates its emergency operating arm known as the National Shipping Authority (NSA). The ships of the National Defense Reserve Fleet are further subdivided into a Ready Reserve Force (RRF) classification based on their projected use in national military emergencies and how quickly they are desired to be pressed into service. The purpose for having ships in the Ready Reserve Force is to provide a Sealift surge capability if needed during a national emergency. The Ready Reserve Force ships are kept in a higher state of readiness which enables them to be removed from their moorings and reactivated in 4, 5, 10, 20, or 30 days in order to meet the surge military logistics requirements in the event of war. This Ready Reserve Force consists of cargo vessels, roll-on/roll-off vessels, bulk petroleum tankers. Table 1 quantifies the 296 vessels in the National Defense Reserve Fleet as of September 30, 1995:

Table 1: National Defense Reserve Fleet -- September 30, 1995⁵

NDRF Retention (1)	NDRF Non-Retention (2)	Reimbursable Custody (3)
155 total	65 total	76 total

Department of Transportation, Maritime Administration 1995 Annual Report, May 1996
(1) Vessel being maintained for emergency activation's, for historic display, or for spare equipment. Number shown includes Ready reserve forces ships.
(2) Vessels pending disposal
(3)Vessels not in the NDRF program and owned by other government agencies or by the Title XI program⁶

Of the NDRF Retention fleet of reserve ships, 92 are ships identified as comprising the Ready Reserve Force. It is the product oil tanker portion of the Ready Reserve Force that amounts to less than 18 percent of the total ships of that program and these are the refined bulk petroleum transportation assets that would be sought in a crisis or emergency situation. It is the intention of National Command Authority that the Ready Reserve Force product oil tankers would be pressed into service if the world commercial fleet of product oil tankers were unable to meet the immediate demands of contracting with the United States government. These particular types of ships would be reactivated from various status' of readiness, crewed on an ad hoc basis, inspected for service by the appropriate Defense Fuels Supply Center Representative, and then quickly

employed if they are ultimately found suitable for the mission. Therefore, these particular oil tanker assets are thought of as *the* last resort resources.

The Ready Reserve Force maintains vessels that support specific missions. The Ready Reserve Force includes two highly specialized product oil tankers whose capabilities are not duplicated in the commercial fleet. What is unique about these two oil tankers is they are equipped with the Offshore Petroleum Discharge System (OPDS). This system allows these oil tankers to approach an undeveloped beach area and establish a product fuel discharge facility emanating from the tanker anchorage offshore. This system can only operate within strict parameters: 35 to 190 feet of water for the Single Anchor Leg Mooring (SALM), within 4 nautical miles of the shore terminal facility, up to sea state 3 for general operation (i.e. maximum 40 knots of wind, 4 knots of current, and 12 foot waves), and sea state 5 for equipment survival.⁷ Whereas this system is useful in a dire emergency, it is not intended for use as a long term substitute for a permanently installed and functional petroleum discharge facility in a developed port. The primary purpose for the OPDS is for use in an undeveloped theater of war where the offshore system is supporting forces ashore through a tactical petroleum terminal, and associated portable equipment, erected to overcome battle damage, poor host country infrastructure, etc. The two product oil tankers that are equipped with OPDS have been incorporated into the Afloat Preposition Force so that their unique features and equipment can be quickly employed if needed.

There has been only one occasion when the product oil tankers of the Ready Reserve Force were activated as part of a larger crisis and contingency operation. This activation was undertaken as part of Desert Shield/Desert Storm, yet it amounted to nothing more significant than a test of the reactivation system for product oil tankers.⁸ The planned crews for these tankers were not mustered to ensure a head count. Other than this reactivation test, no other product oil tankers have been activated as part of large scale operational contingency planning exercises. There is no perceived need to routinely test this capability to reactivate product oil

tankers because of the expense involved in such an exercise and because of the availability of product fuel lift provided by the commercial tankers in the world transportation market. If an enemy were able to destroy large quantities of strategic theater fuel supplies, these tankers will not be able to come online fast enough to resupply the military forces in theater, and a fate accomplished might be handed to the United States, and its allies, from lack of fuel, tactical advantage, and strategic paralysis.

IS THE TANKER MARKET WORKING FOR US?

*"To the spread of our trade in peace and the defense of our flag
a great and prosperous merchant marine is indispensable."⁹*

Theodore Roosevelt, To Congress, 7 December, 1903

The commercial tanker market is designed to provide bulk petroleum transportation services for hire to the refined petroleum producers, traders, and distributors. The importance of understanding the dynamics of the world tanker market is critical in order to determine the risk that the United States assumes when relying upon world market tanker resources being able to provide refined bulk petroleum transportation services in an international emergency. There are many market influences that effect the availability of these ships on a day-to-day basis, the least of which is the possibility that the United States will need a number of them for some future contingency operation.

The global ocean tanker trade route architecture influences the tanker market through the placement of ships near potential cargoes and distribution centers. Refined petroleum products emanate from refining centers throughout the world. Some of the principle refining throughput locations are the Gulf Coast of the United States (Petroleum Administration for Defense District III)¹⁰, the United States West Coast (Petroleum Administration for Defense District V), the Caribbean Basin, Latin America, Organisation for Economic Cooperation and Development (OECD) Europe¹¹, non-OECD Europe, the Middle East, Japan, and Asia.¹² Refined petroleum product tankers principally operate between these refining centers and the locations of product

customers, which may be in close proximity (i.e., Curacao to Houston), or one thousand miles or more sailing distance (i.e. Singapore to Pusan). In the event of war, the United States would be seeking to contract with tanker operators whose ships were in close proximity to suppliers of military grade fuels. One example of this might be a ship working the Far East trade routes being sought to carry an emergency load of military grade jet fuel from Singapore to the Korean Peninsula. With the bulk petroleum tanker already in theater, the tanker would hopefully not have to transit far from when it was brought under United States government contract to load its cargo for delivery to South Korea.

Another factor that influences the tanker market is the size of the ship(s) involved in the trade. The largest oil tankers in the world are the crude oil carriers. Crude oil tankers vary in size from medium-sized (35,000 dwt) to Ultra Large Crude Carriers (ULCC: 360,000+ dwt). Product tankers usually range from small (6,000 dwt) to medium-sized and employ special configurations of equipment for loading and discharge as well as cargo tanks that are specially treated and coated so as not to contaminate the refined product cargoes while in transit. For a product tanker to be useful to the United States military, it should be of a size big enough to deliver a substantial amount of cargo in one voyage. Therefore, a vessel size of 35,000 to 80,000 dwt is a militarily useful tanker. Yet, there could be a complication with tankers approaching or exceeding 80,000 dwt. A ship of this size may too large to be accommodated by a considerable percentage of world ports that could be used in military contingency operations. Draft constraints, lack of terminal space, and limited port storage facility capacity would render larger tankers impractical. In order to avoid these types of complications, a tanker size of 60,000 dwt should become the standard size for describing a military useful product tanker. A product tanker of this size can call on many ports throughout the world as well as deliver bulk cargo quantities whose introduction into the strategic delivery systems represent a significant resupply shipment.

Confusion sometimes enters arguments concerning various types of petroleum carrying tank ships. Crude oil tankers are not multi-use ships, for the most part. These types of tankers are sometimes confused with the product oil tankers. The crude oil carriers are thought of as carrying “dirty” cargoes simply because the crude cargo is incompatible with other petroleum products that have already undergone some form of refining. To mix the products would be to contaminate the refined petroleum product with crude oil. The same holds true for various types and grades of refined fuel products. Aviation grade fuels cannot be mixed with heavier diesel fuels and still be used for aircraft operations, though the diesel fuel that has been mixed with aviation grade fuel may still be usable for vehicles and machinery.

The global demand for refined petroleum product tankers also has significant influence on the tanker markets. The retirement of product oil tankers without replacement is one issue affecting the available numbers of these types of tankers. As tanker operators reevaluate their market share and position, they must determine the business sense of the recapitalization of their tanker fleets in relation to forecasted future profits. The United States merchant marine industry has abdicated its market share of the global product tanker trade in favor of exclusive Jones Act trading.¹³ The global commercial product tanker trade, therefore, is almost exclusively the purview of foreign merchant marine ships.

Of the foreign product tankers involved in commercial trade, a portion of the total number of these ships are categorized as being under Effective U.S. Control (EUSC). This concept of EUSC describes the reality that many of the world's ships, including some product tankers, are owned and operated by United States corporations, but sail under the flag of convenience and foreign registry of another sovereign state such as Panama and Liberia. The U.S. owners of vessels registered in Liberia, Panama, and Honduras have consistently argued that their ships are under effective U.S. (government) control and would be available in the a national emergency. Their assertion is that these ships are, in fact, a part of the U.S. merchant marine. To complicate

matters further on the EUSC issue, in December 1988, a federal court on appeal ruled that the U.S. government does not have the authority to press U.S. owned foreign-flag ships into service.¹⁴ In view of the fragile product tanker market and the practicalities of its day-to-day operation, it does not matter which flag these specialized ships sail under: the available product tankers number only what is needed to satisfy the charter market to haul refined petroleum products and little else beyond that minimum number.

The tanker market has been influenced by the effects of the petroleum product pipeline industry. This industry specializes in the overland transport of refined petroleum products through terrestrial pipeline systems that fan out from distribution hubs. These pipeline systems are present in every country in the world and are used to haul increasing percentages of products that are used by domestic markets. As these systems become more efficient in their reach, line haul storage capacity, and overall throughput capacity, the product tanker requirements have diminished because of this competition.

An important influence on the tanker market has effected the business of shipping in the past 30 years that has increased the costs of participating in the refined petroleum tanker charter market. The aggregate concept of environmental protection, financial responsibility requirements, and attendant penalty provisions have increased the financial risks associated with the commercial operation of petroleum tank ships, particularly in the United States. Statutes such as the Oil Pollution Act of 1990, with provisions such as the requirement for petroleum tankers operating within the United States navigable waters to be of double hull design, have forced the retirement of older tankers, and have restricted the operation of tankers not built to this standard.¹⁵ The littoral and maritime states of the United States have also enacted statutes to stiffen the compensatory damages that will be exacted from shippers of petroleum in the event of accident or non-compliance with state laws. State laws also delineate oil spill clean up equipment, sometimes in addition to the equipment required by the federal government, that will be maintained onboard

the tanker vessel calling in a particular state. These are added costs of doing business in each state where the trade will occur. Owners and operators of product tankers must factor these liabilities and costs into their business operations or execute the conscious decision to depart from the U.S. market.

THE VOLUNTARY TANKER AGREEMENT

"A battle sometimes decides everything and sometimes the most trifling thing decides the fate of a battle."¹⁶

Napoleon I, Letter to Barry E. O'Meara, St. Helena, 9 November 1816

The United States Government has an option available before it must implement any involuntary requisitioning of commercial product fuel tankers from U.S. flagged or EUSC private ownership. This option is the implementation of the Voluntary Tanker Agreement (VTA) for the voluntary contribution and government control of U.S. flagged and EUSC tanker assets from signatory owners to support national defense requirements. The Maritime Administration (MARAD) is the administrating agency for this program and works closely with Military Sealift Command (MSC), the Department of Defense representative in the agreement, when the program accords are activated.

The Voluntary Tanker Agreement is not a recent concept. The original version of the VTA was known as the "Voluntary Plan for Contribution of Tanker Capacity for National Defense Requirements", and was established to support U.S. military operations in the Korean War. The VTA was revised and renamed in 1983 and issued under the VTA title by MARAD through the Federal Register. The VTA is renewed biennially in accordance with the Department of Justice stipulations for the avoidance of anti-trust defense. The Agreement establishes the terms, conditions, and general procedures under which each Participant agrees voluntarily to make tankers and tanker space available to the Department of Defense at the request of the Administrator.¹⁷

The Agreement is designed to create close working relationships among the Administrator, the Department of Defense, and Participants through which military needs and the needs of the civil economy, as they exist at the time the Agreement is activated, can be met by cooperative action. The Agreement provides for responsive of defense needs with minimum disruption of industrial operations and affords Participants maximum flexibility to adjust their commercial operations to meet current and projected defense requirements.¹⁸

The VTA is similar to the Civil Reserve Air Fleet (CRAF) program both in scope and purpose. The CRAF program had never been activated prior to Operation Desert Shield/Desert Storm and the program worked well through Stages I and II, which coincided with initial troop buildup and the air war prior to the start of the ground offensive. Stages I and II were supported by 76 Long Range International (LRI) passenger aircraft and 40 LRI cargo aircraft. Of these, United States Transportation Command (USTRANSCOM) was primarily interested in the cargo aircraft.¹⁹ Table 2 identifies the total number of CRAF participants in Desert Shield/Desert Storm. The assets that could be provided to the United States government under CRAF Stages I

Table 2: Civil Reserve Air Fleet (CRAF) participants in Desert Shield/Desert Storm²⁰

CARRIER NAME	CARRIER NAME
American	American Trans Air
American West	Buffalo Airways
Connie Kalitta	Continental
Delta	Emory/Rosenbalm
Evergreen	Federal Express
Florida West	Hawaiian
Northwest	Pan American
Southern Air	Sun Country
Tower	Trans World
United	United Parcel
World	

and II represented 76 LRI passenger aircraft (14% of total available fleet of 546) and 40 LRI cargo aircraft (19% of total available fleet of 207).²¹ The list of CRAF participants reads as the

"WHO'S WHO" of U.S. and international air carriers. The significant and crucial contributions made by these carriers were by less than 20 percent of the available commercial aircraft in both LRI passenger and cargo categories.

The CRAF participants would have faced more daunting challenges had CRAF Stage III been activated. Stage III, combined with Stage I and II aircraft, would have given the United States Government access to 252 LRI passenger aircraft (46% of total available fleet of 546) and 150 LRI cargo aircraft (72% of total available fleet of 207).²² As it turned out, the short duration of the war and a rapidly diminishing backlog of air-eligible cargo made activation of CRAF Stage III unnecessary. Would the VTA be able to function as well as the CRAF?

The VTA will fail to support its commitments. The following data outlines the requirements and status of VTA tank ships.²³

1. VTA product tank vessels should be of a "military useful size" (2,000 dwt to 100,000 dwt clean product and chemical tankers)
2. 75-80% of the Department of Defense petroleum, oil, and lubricants (POL) requirements for contingency lift is jet fuel. Jet fuel carriage requires coated tanks and rigid quality assurance standards found in few tankers. The remainder of DoD's lift requirement is diesel fuel, which is less technically demanding.
3. 1995 world tanker market: 6,618 liquid product tankers
1995 world tanker market: 330 tankers out of 6,618 total tankers are capable of carrying jet fuel (4.9%)
4. 1995 VTA status: 196 tankers (132 military useful: 67%)
** includes 98 U.S. Flag tankers (78 military useful: 79%) and 98 EUSC tankers (54 military useful: 55%)
5. Projected loss of 61 U.S. flag tankers between 1995 and 2005 under 100,000 dwt
6. 2005 projected U.S. flag tankers under 100,000 dwt: 33 tankers

Unlike the CRAF participants, the VTA participants are not as numerous as and do not represent the most powerful product tank ship owners in the world. Companies such as Exxon, Mobil,

Texaco, Gulf operate product tankers that cannot be dispensed with from industry use as easily as aircraft. Other companies operating in the charter market have ships operating at full employment. Had the CRAF Stage III program been implemented, true pain would have struck the air cargo market and the economic paralysis from cargo capacity loss would have made itself known. For petroleum product shippers, substituting their carriage volume with pipeline transport or rolling stock transport is impractical simply because of volume and delivery delays when analyzed against the requirements of the U.S. domestic market. International petroleum product transport must overcome the impediments of ocean transport in most cases. For air cargo shippers, loss of aircraft availability in the U.S. domestic market can be made up through intermodal or ground transport means that can easily substitute for volume and deliver goods with delays measured in hours. International air cargo can find capacity with foreign air carriers to diminish the burden. The difference between VTA and CRAF is that there exists an air fleet and ground transport "safety valve capacity" substitution that can be employed to shift capacity if the U.S. military invades the market with its requirements. There is no such "safety valve capacity" substitution in the market supported by VTA tank ships. The VTA program essentially starts out at a comparable CRAF Stage III disadvantage when analyzed against the current and project product tanker charter market.

The specialized design of product tank ships built to haul jet fuels further complicates the problem of availability, particularly because jet fuel represents such an overriding majority of U.S. military bulk transport requirements. As discussed earlier, there are many influences that work to complicate the availability of the right-size tanker, built to haul specific grades of fuel, trading in geographic areas that lend themselves into being translated into military missions, able to pass the applicable U.S. environmental laws, and Defense Fuel Supply Center strict acceptance inspection. Obviously many variables coming out of these market influences must fall into proper place during a crisis in order to make this Agreement workout for the benefit of the United States.

The problem is insolvable now for a two MRC fight where host nation fuel support is negated.

The disaster surrounding looms larger after the year 2003.

THE ECONOMICS OF CHARTERING MARKETS

*"Modern war is a death grapple between peoples and economic systems,
rather than a conflict of armies alone."*²⁴

Bernard M. Baruch, 1870-1965

There are typically three players in the charter markets: the owners of the vessels, the charterers, and the brokers. The brokers serve as the intermediaries between the owners of vessels and those who wish to contract for the services of these vessels. Modern communications technology has served the charter market by closing the gap between all parties concerned through instantaneous communications (i.e. telex, telephone, and modem) that have improved the overall market efficiency. These same communications improvements have also brought individual brokers and brokerages together into networks of business units. The basis of efficiency in the tanker charter market is therefore speed of contracting and global linkage of business units, which also includes the individual ships for hire. Locating ships appropriate for hire, that meet the requirements of a specific charterer under the terms offered, is the business of the broker.

If the United States government required the services of a commercial petroleum product tanker, United States Transportation Command (USTRANSCOM) would delegate the contracting function to Military Sealift Command (MSC), who in turn would contact a brokering agent to locate an appropriate ship. The terms of the charter would specify the location of cargo loading and discharge, type of cargo to be transported, dates associated with the cargo movement, and schedule of penalties and other performance requirements. Once the charter parties agreed to the terms, and the charter was executed, the chartered vessel would be notified

of the terms and dates of the charter. The chartered ship makes its way to the appropriate port to fulfill the stipulations of the charter.

When a chartered commercial tanker arrives at the designated port, the ship is met by the appropriate representatives from the Defense Fuel Supply Center (DFSC). The Defense Fuel Supply Center is a charter element of the Defense Logistics Agency (DLA). DFSC is the government agency that owns bulk petroleum products from the location of purchase until it is distributed and used to fuel vehicles, ships, and aircraft owned or operated by the United States government. Within the DFSC structure, the Center relies on sub-components to assist in the management, movement, and distribution of fuels. These sub-components are the Defense fuels Regions (DFR) and the Defense Fuels Offices (DFO). The DFR's and DFO's are local points for arranging and coordinating most of its fuel deliveries. These offices maintain close working relationships with customers, terminals, refineries, and various defense transportation agencies. The DFO' and DFR's also provide information and advice on transportation requirements, delivery patterns, and the efficient and economical movement of fuel within their assigned geographical areas of responsibility.²⁵

However, the chartered vessel is still not cleared to load the United States government cargo. Once the chartered vessel arrives at the loading port, or an intermediary port while enroute, the vessel must submit to an acceptance inspection. This inspection is conducted by the trained quality assurance and quality surveillance inspection personnel from DFSC who adhere to strict and comprehensive guidelines to ensure that the chartered product tanker meets all specified contract equipment requirements, conditioning procedures, and is suitable for loading. Inspection and testing includes items such as: tank sampling (coated and non-coated), tank visual inspection (coated and non-coated), verification of previous two cargoes, equipment calibration, pumproom safety, emergency firefighting equipment availability, etc. The emphasis is not only ship's safety, but also protection of the cargo as a monetary and national security investment. These inspections

must be conducted quickly to avoid demurrage as well as to determine criteria for loading disqualification (and what measures must be taken to bring the vessel into compliance with the charter requirements). DFSC representatives will not expedite cargo movements at the expense of quality or quantity because of the national security interests involved and the lives of people who depend on quality fuel. Inspections of cargo and conveyance will also be conducted at the destination port prior to off-load. If a vessel is rejected at the loading stage of charter execution, reasonable repairs might be performed without much delay in the loading and sailing schedule. If the inspection discrepancies are aggravated and cannot be corrected, then the U.S. government must continue the search for a suitable vessel for hire. This is a delay in the conveyance of the fuel to the strategic theater where it is needed and may translate into a strategic crisis or tactical dilemma on the battlefield.

THE CHARTER MARKET AND NATIONAL DEFENSE

*"For want of a nail, the shoe was lost - for want of a shoe, the horse was lost - for want of a horse the rider was lost - for want of a rider the battle was lost."*²⁶

Benjamin Franklin, 1706-1790

The commercial product tanker charter market is a complicated and fast paced business institution. The current status of the tanker market, both in terms of vessel availability to assume expanded commitments beyond routine business charters and the severe economic impact of delayed shipments of refined petroleum products to commercial markets resulting from strictly military mission support, is fragile. A gross adjustment to the product tanker market, an example of which is the intrusion of the United States government into the steady market in order to haul military fuel in support of a major regional conflict beyond the succor of local refining capacity, may cause a global fuel crisis of dramatic proportions. We have examined how the product tanker charter market functions, product tanker operations, market influences, market brokerage, and Defense Fuel Supply Center organization, operations and inspections. We have examined the

consequences of refusing to accept an unsuitable product tanker prior to loading, consequences that readily translate into military problems in the strategic theater and the tactical battlefield. The product tanker charter market is occupied by tank ships that are maintaining a strict balance between demand for tankers and the supply and availability of those specialized ships. There are no idle commercial product tankers operated for profit laying around waiting for an international emergency to scoop them up in gainful employment. The market supply of ships cannot expand to assume the commitments of routine trade and international emergency concurrently. The problem is unmanageable for one Major Regional Conflict (i.e. Arabian Gulf war that destroys Saudi, Kuwaiti, and Emirate refining throughput) and gruesome when applied to a simultaneous second major regional conflict (i.e. Korean Peninsula). Each tanker is a money making economic unit for its owners and if it is not employed, it is not efficient. If the vessel is not efficient, for many and varied reasons such as non-compliance with enacted environmental protection laws or outmoded equipment, it is scrapped. There appears to be a great amount of optimism on the part of government and military agencies involved with acquiring product tanker lift that the world market will respond to the crisis without serious economic or strategic military penalty. The panacea is money: money used to secure the lift for the United States military and the problem is solved from only one point of view. The solution to this problem of lack of accessible product tankers is money, but not money thrown into obstructing the finely tuned and critically balanced global product tanker charter market to the detriment of the U.S. and global economy.

FIXING THE PROBLEM FOR THE FUTURE

*"Success, like charity, covers a multitude of sins."*²⁷
Alfred Thayar Mahan, Naval Strategy, 1911

The appropriate solutions to the current product tanker shortage, for the United States, are necessarily long term endeavors that will require careful management and meticulous investment.

The following series of proposals will make great strides in solving the problem in view of how the charter market really works:

1. Preposition additional fuel socks afloat: this will require the purchase and stationing of additional prepositioned product fuel tankers in the existing Afloat Preposition Force. This measure would alleviate a crisis in ocean transportation requirements supported by the product tanker charter market as well as dodge the immediate effects of a loss of refining throughput in a strategic theater such as the Arabian Gulf. The expense of this program is justified as an insurance measure taken against an enemy that recognizes fuel as a critical vulnerability of U.S. forces and is capable of destroying large percentages of strategic fuel stocks.
2. Increase the Ready Reserve Force tanker fleet: replace current tanker assets with Oil Pollution Act (1990) compliant vessels. Outfit these vessels for operations in designated States and maintain them in a 10-day and 20-day reactivation status. Increase the overall number of product tanker vessels in the 60,000 dwt size category to a number that is consistent with that needed to fight a dual Major Regional conflict scenario. Compliance with environmental statutes will move the program in the proper direction both in both military usefulness and environmental safety.
3. Create the Ready Reserve Logistics Cadre: develop and implement a reserve component personnel program strictly to operate the Ready Reserve Force ships. The leadership can be sought from the ranks of retiring and retired naval officers and merchant marine officers. Offer lump sum bonuses to these personnel to participate in the program for 5 and 10 years. Offer formal training in strategic logistics issues, business aspects of shipping, tanker operations, intermodal operations, etc. The goal here is to develop a solidly trained and committed cadre of leaders and managers that understand the vision for the implementation of the reserve ships and can execute the required mission with little formal guidance. Also, the United States would benefit from the cumulative experience of such a highly trained personnel force for a definite

block of time. Hire these professionals, offer additional training, pay them at reserve pay rates, drill them according to reserve drill schedules, and generally make it worth their while. For the other ratings needed to crew these ships, apply the same training , monetary, and retiring/retired personnel hiring philosophy to seek the needed skills. Offer them a path that leads to higher levels of leadership and management in the Cadre program.

Create entry level interest in the program by folding introductory courses into the Navy Junior Reserve Officer Training Program (NJROTC). Reach out for young Americans and educate them about vital logistics systems and offer them a goal for their future: if they participate in a reserve program that supports the Ready Reserve Logistics Cadre, give them Navy college scholarship preferences, drilling reserve promotions for staying with the program if they do not qualify for the scholarships, college tuition subsidies for pursuing curriculums in logistics subjects, and if they choose active duty naval service, raise them through the ranks in what remains of the Combat Logistics Force.

Special consideration should be given to grooming diesel engineering personnel. The skilled personnel in these ratings would probably be hard to muster for government or military service on short notice. This focus on marine diesel engineering will be consistent with merchant marine industry requirements for current ships in operation. Steam propulsion in the merchant marine is obsolete. These personnel measures will greatly improve the viability of any program aimed at bolstering our poor position in overall logistics Sealift capability, particularly in product tanker lift.

4. Get American Merchant Marine Labor Unions involved in fixing this problem: American merchant marine labor unions have not been standing by, silently watching the demise of their industry. To ensure the vigor of any program involving commercial types of seagoing vessels, the merchant marine labor unions must be brought into the planning, implementation, and management of the revitalization of the product tanker force and the Sealift program in general.

They have the experience and skill to make this half military, half merchant marine, vision-for-a-force idea work. They also have experienced personnel who can teach the curriculum at various levels of leadership and management.

5. Prove the appropriate range and scope of the Voluntary Tanker Agreement (VTA): Spend the money to flex the VTA to see if it really works as designed. Cause a disruption in the commercial charter market to underscore or disprove the popular opinion that the commercial tanker charter market can or cannot support the United States in time of crisis. Conjecture will not suffice through the procession of Mobility Requirements Studies, Bottom Up Reviews, Tanker Studies, academic wrangling, and who knows what else will come next to hedge the bets on product tankers. Call the ships up and get a reality check on the success or consequences of the program. Prove the issue to Congress and the warfighters. Pay for this test now rather than jeopardize the fighting forces in a strategic theater because a theory was not proven in a real world market test.

6. Develop a Role Specialist Nation (RSN) concept for product tanker support: RSN is a simple concept as it is now applied to the bulk fuel supply efforts in support of the multinational forces in the former Yugoslavia. The concept is: pick a commodity and have one nation provide support for everyone else.²⁸ As it applies to the product tanker dilemma, perhaps a nation or group of nations can support the United States in a unilateral or multinational military operation by not sending troops, but rather send their product tankers. Yes, these are the same commercial product tankers that participate in the world charter market that is so fragile in its economic balance. However, if these nations do not provide troops, materials, or resources other than the tankers, perhaps their domestic consumption rates can be lowered, so that product tanker delivery demands can also be lowered to free up the vessels to support the international military effort?

By reducing the demand for refined petroleum product delivery by doing such things as scaling back military training, fleet operations, and general fuel consumption, additional tankers may be freed to meet the military demand. This procedure might well be applied to the United States, but

in reality, the United States will most likely be the lead nation in the international operation. Also, the United States is probably the worst candidate for supplying product tankers as we have seen in this analysis. Lead nation status will translate into a requirement for the United States to maintain high output levels of all types and categories of military supplies to keep the effort going. No doubt that all of the economies of the world would be impinged upon by this Role Specialist Concept, but outright disaster might be averted. NATO countries of modest military means, yet in possession of the appropriate merchant tankers, could fulfill this function well enough. Economic disaster might also be avoided because of the adjustments on fuel demands in the specialist nations until the United States Ready Reserve ships could be brought to the strategic fight with their first delivery of resupply fuel.

CONCLUSION

The fragile state of the current product tanker charter market reveals this source of shipping, in the event of a international military crisis involving the bulk fuel support of large units of United States military forces, as being unreliable to satisfy our needs. The influences that bear on the world product tanker charter market are such that the availability of these types of ships to satisfy the Sealift need in support of an emergency is non-existent. The United States cannot rely on its ability to hire these ships away from their routine trade to satisfy our emergency military requirements because of the dire economic consequences that could follow this short sighted course of action. The United States would be seen as irresponsible and reckless if it took willful actions to solve its own military problems by knowingly and willfully plunging the globe into economic crisis through disruption of the tanker market.

The solutions proposed in this analysis are expensive, but so are the consequences of not solving this product tanker lift shortage. In an era of fiscal austerity, and in the absence of a peer military competitor, a slow and deliberate policy of bolstering our tanker Sealift program is acceptable rather than a grandiose windfall investment that would provide some ships without

addressing the long term manning of those ships. To pursue all or some of the proposals in this analysis will lead the nation toward solving this dire problem that looms in the shadows of military readiness. A steady investment plan that provides a cure is much more acceptable, politically and fiscally, and stands the best chance of being accepted and supported as a prudent plan.

BIBLIOGRAPHY

Ackley, Richard T. Sealift and National Security. Annapolis, Maryland: U.S. Naval Institute Proceedings, July 1992, U.S. Naval Institute Press, copyright 1992

Clark, Wilson, and Page, Jake. Energy, Vulnerability, and War. New York: W.W. Norton & Company, copyright 1981

Conrad, Scott W. Moving the Force: Desert Storm and Beyond. National Defense University, Washington: U.S. Government Printing Office, copyright 1994

De La Pedraja, Rene. The Rise and Decline of U.S. Merchant Shipping in the Twentieth Century. New York: Twayne Publishers 1992

Eccles, Henry E. Logistics in the National Defense. Harrisburg, Pennsylvania: The Stackpole Company, copyright 1959

Gray, Colin S. and Barnett, Roger W., eds. Seapower and Strategy. Annapolis, Maryland: Naval Institute Press, copyright 1989

Heinl, Robert D. Dictionary of Military Quotations. Annapolis, Maryland: Naval Institute Press, copyright 1966

Johnson, James C. and Wood, Donald F. Contemporary Transportation. Tulsa, Oklahoma: PennWell Publishing Company, copyright 1983

K-III Reference Corporation, World Almanac Books. The World Almanac 1997. Mahwah, New Jersey: K-III Corporation, World Almanac Books, copyright 1996

Kendall, Lane C. The Business of Shipping. Centreville, Maryland: Cornell Maritime Press, copyright 1986

Kurz, Charles II. Oil Tanker Chartering: An Economic and Historical Analysis. Philadelphia, Pennsylvania: University of Pennsylvania Press, copyright 1969

Marton, G.S. Tanker Operations. Centreville, Maryland: Cornell Maritime Press, copyright 1984

McMahon, Jeffrey C. Point Paper: Provide CINCTRANS information on VTA. USTRANSCOM, Scott AFB, Illinois: unpublished paper, 29 August 1995

National Petroleum Council. Petroleum Storage & Transportation: Executive Summary. Washington, April 1989

National Petroleum Council. Petroleum Storage & Transportation: Volume II. Washington, April 1989

National Petroleum Council. Petroleum Storage & Transportation: Volume V. Washington, April 1989

Natkiel, Richard and Pimlott, John. Atlas of Maritime History. New York , New York: Gallery books, copyright 1988

Pagonis, William G. Moving Mountains. Boston, Massachusetts: Harvard University Press, copyright 1992

Van Creveld, Martin. Supplying War. Cambridge, United Kingdom: Cambridge University Press, copyright 1977

Weigley, Russell F. The American Way of War. New York: Macmillan Publishing Company, copyright 1973

West, Jim. International Petroleum Encyclopedia: 1995. Tulsa, Oklahoma: PennWell Publishing Company, copyright 1995

White, Eston T. Transportation. National Defense University, Washington: U.S. Government Printing Office, copyright 1981

Whitehurst, Clinton H. The U.S. Merchant Marine. Annapolis, Maryland: Naval Institute Press, copyright 1983

Whitehurst, Clinton H. The U.S. Shipbuilding Industry. Annapolis, Maryland: Naval Institute Press, copyright 1986

UNITED STATES GOVERNMENT PUBLICATIONS

Defense Fuel Supply Center, Public Affairs Office. Defense Fuel Supply Center: Your Energy Supplier. Fort Belvoir, Virginia: U.S. Government Printing Office.

Department of the Army, Office of Military History. Command Decisions. Kent R. Greenfield, eds. Washington: U.S. Government Printing Office, copyright 1959

Department of Defense, Office of the Chairman of the Joint Chiefs of Staff and the United States Transportation Command. So Many, So Much, So Far, So Fast. Washington: U.S. Government Printing Office, copyright 1995

Department of Defense, National Defense University. Strategic Assessment 1997. Washington: U.S. Government Printing Office, copyright 1985

Department of Defense, Office of the Chairman of the Joint Chiefs of Staff. Joint Vision 2010. Washington: U.S. Government Printing Office, copyright 1996

Department of Defense. Military Standardization Handbook: Quality Surveillance Handbook for Fuels, Lubricants, and Related Products. MIL-HDBK-200G, 1 July 1987

Department of Defense, Defense Logistics Agency. Management of Bulk Petroleum Products, Storage, and Distribution Facilities. DLAM 4155.1, 10 February 1988

Director, Joint Chiefs of Staff. Joint Tactics, Techniques, and Procedures for Joint Logistics Over the Shore. Joint Publication 4-01.6. Washington: U.S. Government Printing Office, 22 August 1991

U.S. Department of Transportation, Maritime Administration. Economic Support Shipping. Washington: U.S. Government Printing Office, copyright 1985

U.S. Department of Transportation, Maritime Administration. 1995 Annual Report. Washington: U.S. Government Printing Office, May 1996

U.S. Department of Transportation, Maritime Administration. MARAD OPLAN 001A: Section 530, Voluntary Tanker Agreement. Washington: U.S. Government Printing Office, 30 January 1990

Director, Joint Chiefs of Staff. Joint Petroleum Doctrine. Joint Publication 4-03. Washington: U.S. Government Printing Office, 25 July 1995

Federal Register, Code of Federal Regulations. 33 CFR parts 155 and 157; 46 CFR Parts 30, 32, 70, 90, and 172. Double Hull Standards for Vessels Carrying Oil in Bulk. Washington: U.S. Government Printing Office, copyright March 1995

ENDNOTES

¹Heinl, Robert D. Dictionary of Military Quotations. (Annapolis, Maryland: Naval Institute Press, copyright 1966). pg. 124

²Heinl, Robert D. Dictionary of Military Quotations. (Annapolis, Maryland: Naval Institute Press, copyright 1966). pg. 148

³Weigley, Russell F. The American Way of War. (New York: Macmillan Publishing Company, copyright 1973). pg. xiv

⁴Heinl, Robert D. Dictionary of Military Quotations. (Annapolis, Maryland: Naval Institute Press, copyright 1966). pg. 274

⁵U.S. Department of Transportation, Maritime Administration. 1995 Annual Report. (Washington: U.S. Government Printing Office, May 1996). pg. 6

⁶Refers to Title XI of the Merchant Marine Act of 1936 which provides that the U.S. government will guarantee on obligations issued by an American shipowner to finance up to 87.5% of the cost of building or reconstructing U.S.-flag vessels. The Titles XI program has given U.S.-flag shipowners an access to the long-term U.S. capital markets. Whitehurst, Clinton H. The U.S. Merchant Marine. (Annapolis, Maryland: Naval Institute Press, copyright 1983). pgs. 104-109

⁷Director, Joint Chiefs of Staff. Joint Tactics, Techniques, and Procedures for Joint Logistics Over the Shore. Joint Publication 4-01.6. (Washington: U.S. Government Printing Office, 22 August 1991) pg. XI-5

⁸Department of Defense, Office of the Chairman of the Joint Chiefs of Staff and the United States Transportation Command. So Many, So Much, So Far, So Fast. (Washington: U.S. Government Printing Office, copyright 1995). pgs. 276-277

⁹Heinl, Robert D. Dictionary of Military Quotations. (Annapolis, Maryland: Naval Institute Press, copyright 1966). pg. 187

¹⁰Petroleum Administration for Defense Districts (PADD): a geographic aggregation of the 50 states and the District of Columbia into five districts originally designed by the Petroleum Administration for Defense in 1950 for the purpose of managing petroleum resources. National Petroleum Council. Petroleum Storage & Transportation: Executive Summary. (Washington, April 1989). Glossary

¹¹Organisation for Economic Cooperation and Development (OECD) Europe: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Liechtenstein, Luxembourg, Monaco, Netherlands, Norway, Portugal, San Marino, Spain, Svalbard/Jan Mayen Island,

Sweden, Switzerland, Turkey, United Kingdom. K-III Reference Corporation, World Almanac Books. The World Almanac 1997. (Mahwah, New Jersey: K-III Corporation, World Almanac Books, copyright 1996) pg. 240

¹²West, Jim. International Petroleum Encyclopedia: 1995. (Tulsa, Oklahoma: PennWell Publishing Company, copyright 1995). pg. 323

¹³Refers to the Merchant Marine Act of 1920 sponsored by Senator Wesley Jones. The Act had many provisions that were designed to protect the U.S. merchant marine from foreign competition, stimulate subsidized domestic shipbuilding and U.S. flag ship operations. The Act also established cabotage laws where seagoing trade within the United States and its territories was to be the exclusive market reserved for U.S. flag merchant shipping.

¹⁴Ackley, Richard T. Sealift and National Security. (Annapolis, Maryland: U.S. Naval Institute Proceedings, July 1992, U.S. Naval Institute Press, copyright 1992). pgs. 41-47

¹⁵Federal Register, Code of Federal Regulations. 33 CFR parts 155 and 157; 46 CFR Parts 30, 32, 70, 90, and 172. Double Hull Standards for Vessels Carrying Oil in Bulk. (Washington: U.S. Government Printing Office, copyright March 1995).

¹⁶Heinl, Robert D. Dictionary of Military Quotations. (Annapolis, Maryland: Naval Institute Press, copyright 1966). pg. 26

¹⁷U.S. Department of Transportation, Maritime Administration. MARAD OPLAN 001A: Section 530, Voluntary Tanker Agreement. (Washington: U.S. Government Printing Office, 30 January 1990). pgs. 530-1 through 530-C-4

¹⁸Department of Transportation, Maritime Administration. MARAD OPLAN 001A: Section 530, Voluntary Tanker Agreement. (Washington: U.S. Government Printing Office, 30 January 1990). pg. 530-2

¹⁹Department of Defense, Office of the Chairman of the Joint Chiefs of Staff and the United States Transportation Command. So Many, So Much, So Far, So Fast. (Washington: U.S. Government Printing Office, copyright 1995). pg. 43

²⁰Department of Defense, Office of the Chairman of the Joint Chiefs of Staff and the United States Transportation Command. So Many, So Much, So Far, So Fast. (Washington: U.S. Government Printing Office, copyright 1995). pgs. 45-46

²¹Department of Defense, Office of the Chairman of the Joint Chiefs of Staff and the United States Transportation Command. So Many, So Much, So Far, So Fast. (Washington: U.S. Government Printing Office, copyright 1995). pgs. 45-46

²²Department of Defense, Office of the Chairman of the Joint Chiefs of Staff and the United States Transportation Command. So Many, So Much, So Far, So Fast. (Washington: U.S. Government Printing Office, copyright 1995). pgs. 45-46

²³McMahon, Jeffrey C. Point Paper: Provide CINCTRANS information on VTA. (USTRANSCOM, Scott AFB, Illinois: unpublished paper, 29 August 1995)

²⁴Heinl, Robert D. Dictionary of Military Quotations. (Annapolis, Maryland: Naval Institute Press, copyright 1966). pg. 156

²⁵Defense Fuel Supply Center, Public Affairs Office. Defense Fuel Supply Center: Your Energy Supplier. (Fort Belvoir, Virginia: U.S. Government Printing Office). pg. 18

²⁶Heinl, Robert D. Dictionary of Military Quotations. (Annapolis, Maryland: Naval Institute Press, copyright 1966). pg. 315

²⁷Heinl, Robert D. Dictionary of Military Quotations. (Annapolis, Maryland: Naval Institute Press, copyright 1966). pg. 315

²⁸Defense Fuel Supply Center, Public Affairs Office. Defense Fuel Supply Center: Your Energy Supplier. (Fort Belvoir, Virginia: U.S. Government Printing Office). pg. 33